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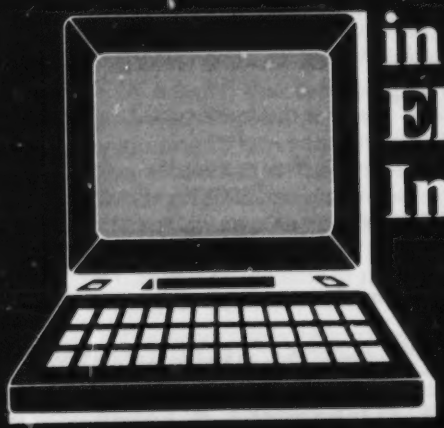
Intellectual Property Rights

in an Age of Electronics and Information



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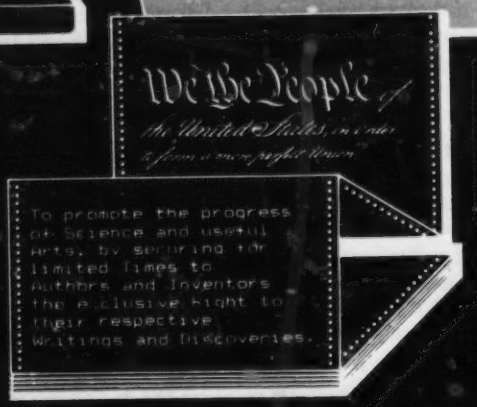

CONGRESS OF THE UNITED STATES
Office of Technology Assessment

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Foreword

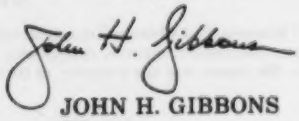
This report examines the impact of recent and anticipated advances in communication and information technologies on the intellectual property system. It focuses primarily on the Federal copyright system, and on the continuing effectiveness of copyright law as a policy tool in the light of technologies such as audio- and videorecorders, computer programs, electronic databases, and telecommunications networks. To obtain a comprehensive view, the study examined the intellectual property system from a number of perspectives: the constitutional basis of intellectual property policy; the system's goals, laws, and economics; the creative environment; problems of enforcement; the international context; and the Federal role in administering intellectual property rights.

OTA found that technological developments are affecting all aspects of the intellectual property system. Moreover, because we are only beginning to move into the era of electronic information, the full impact of new technologies will not become fully apparent for some time. Fundamental changes are occurring in information technologies that will antiquate many of the policy mechanisms now in force, and bring new intellectual property problems requiring new solutions. Thus, even if Congress acts now in response to current problems, it will need to be prepared to act again within the next decade.

The report was requested by Senator Charles McC Mathias, Jr., Chairman of the Senate Judiciary Committee, Subcommittee on Patents, Copyrights and Trademarks; and by Congressman Peter W. Rodino, Jr., Chairman of the House Judiciary Committee, Congressman Robert W. Kastenmeier, Chairman of the Subcommittee on Courts, Civil Liberties, and the Administration of Justice, Congressman Hamilton Fish, and Congressman Carlos Moorhead.

In preparing this report, OTA has drawn on working papers developed by OTA staff and contractors, the comments of participants at seven OTA workshops held to discuss issues, the results of two public opinion surveys conducted by Yankelovich, Skelly & White, and conversations between OTA staff and over 130 interested individuals. Drafts of the report were reviewed by the OTA advisory panel, officials from the Copyright Office, the Patent and Trademark Office, the Library of Congress, the Department of Commerce, the Department of State, the Office of the U.S. Trade Representative, and a broad range of individuals from law firms, public interest groups, trade associations, private industry, and academia.

OTA appreciates the participation of the advisory panelists, workshop participants, Federal agency officials, and interested citizens, without whose help this report would not have been possible. The report itself, however, is the sole responsibility of OTA, not of those who ably advised and assisted us in its preparation.



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The Advisory Panel provided advice and constructive criticism throughout this project. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Intellectual Property Rights in an Age of Electronics and Information

Domestic intellectual property law—principally the law covering patents, copyrights, and trademarks—is rooted in the United States Constitution. Under the law, the Government is authorized to grant intellectual property rights not as rewards but as inducements to authors and inventors to create and disseminate intellectual works. The statutory nature and purpose of the constitutional authorization is stated explicitly in the 1909 Copyright Act:

> The enactment of copyright legislation by Congress under the terms of the Constitution is not based on any natural right that the author has in his writings, for the Supreme Court has held that such rights as he has are purely statutory rights, but on the ground that the welfare of the public will be served and progress of science and useful arts will be promoted . . . Not primarily for the benefit of the author, but primarily for the benefit of the public such rights are given. Not that any particular class of citizens, however worthy, may benefit, but because the policy is believed to be for the benefit of the great body of people, in that it will stimulate writing and invention to give some bonus to authors and inventors.

The mechanisms by which the intellectual property system worked in the past were straightforward. The Government granted rights to an author or inventor. From this point on, the Government's role was relatively minor. Rewards were determined in the marketplace. In order to benefit from copyright, an author had to publish his works, thus making them available to the public. In order to obtain a patent, the inventor had to reduce his ideas to useful applications. The holders of copyrights and patents holders were responsible for detecting infringements and preventing unauthorized use of a work. Enforcing one's right was not unduly burdensome. This was particularly true in the case of copyright. Given the expense and the organizational requirements needed to reproduce works there were only a limited number of printers, and thus it was relatively easy to keep track of their activities.

Today, however, technology is complicating this process and undermining many of the mechanisms that governed the system in the past. This trend is likely to continue; today's technologies are the beginning, not the end, of the information revolution. Computers, two-way interactive cable, fiber optics, optical disks, communication satellites, and other devices are becoming steadily more sophisticated and powerful, and their uses are expanding almost daily. The greatest impact, however, will come not from single technologies, but rather from their use in combination.

Although Congress has always had to reckon with technological change, the new information and communications technologies available today are challenging the intellectual property system in ways that may only be resolvable with substantial changes in the system or with new mechanisms to allocate both rights and rewards. Once a relatively slow and ponderous process, technological change is now outpacing the legal structure that governs the system, and is creating pressures on Congress to adjust the law to accommodate these changes. The pressures are coming from a number of different parties, and they are motivated by a wide range of concerns:

- **Authors, publishers, film makers, and producers; representatives of the recording industry; and other copyright holders whose works can be delivered electronically:** This group is concerned that technologies such as tape recorders and videocassette recorders are so widely used that they undermine their ability to enforce their copyrights. They are calling on Congress to adopt stronger enforcement measures. Alternatively, some group members would like Congress to provide new ways to protect their incomes, such as imposing taxes or royalties on blank tapes.
- **Designers and producers of computer software and other functional works that do not fit comfortably into existing categories of intellectual property law:** This group is concerned that, given the uncertainties in the law, their works will be inadequately protected. They are calling for more explicit and extensive protection under existing or under new laws.
- **Database producers, information analysts, and others who package existing information for specific uses:** This group opposes restrictions on the use and reuse of copyrighted materials. They also want incentives to be reallocated so that they receive a greater financial return for the value that they add to information by analyzing, reorganizing, and packaging it.
- **Manufacturers of equipment capable of copying, reproducing, or recording (paper copiers, satellite antennas, videocassette recorders, and audio tapes):** Members of this group oppose the imposition of taxes or royalties on tapes and any other actions that might increase the cost of their products to the consumer, or that make them less convenient to use. They claim that they aid copyright holders by creating new markets for products and so should not be penalized by having taxes imposed.
- **Educators and scientists:** Members of this group generally oppose extensions of the law, arguing that such extensions would make the resources and materials they need to do their work prohibitively expensive. Some members of this group seek to exempt educational uses from the law. Others are calling for licensing agreements that would allow them to use copyrighted materials at reduced rates.
- **The general public:** Many people are becoming increasingly accustomed to having new technology available at low cost to use as

they please in their homes and offices. They want assurance that they can continue to copy films, records, and other information for their private use.

- **Developing countries**: Many developing countries want to use American intellectual property products to further their social, economic, and political development. These nations believe that the United States and other industrialized nations should relax intellectual property protection so that they can afford to make use of these new products and services.

These competing interests give rise to policy questions that resist quick, simple answers. Part of the problem is that new technologies are bringing new parties into the intellectual property debate, many of whom hold values and attitudes that differ from those of more traditional players—the authors, printers, and publishers, for example. The extreme case of this is the so-called computer "hacker" who believes that software and other forms of information should be shared freely. Holding less extreme but more common views are those members of the public who believe that they should be able to continue to use the new technologies to copy materials, at home, for their own personal use. In addition, there are those secondary information providers—information brokers and database producers, for example—who, in contrast to the original creators of information, want fewer restrictions on the use and reuse of information.

Complicating intellectual property issues even further is the fact that technology is also changing the roles that people involved in the copyright system play. In fact, taking advantage of the new technologies, many people now play multiple roles, and their attitudes about intellectual property protection may vary accordingly.

The relationship among traditional players are also changing, breaking down old alliances, and generating some new ones. Working on an electronic network, for example, the author of a book can now edit, print, publish, and distribute his works; tasks that were traditionally within the purview of the publisher. Under these circumstances, the author may be less inclined to assign his rights to the publisher. Similarly, because it provides new outlets for distribution such as pay-per-view cable television and videocassettes, technology is also changing the relationships among film makers, film producers, and film distributors. Transmitting his works directly to the user on videocassettes, for example, an independent film maker can circumvent the major film companies and, in the same fashion, a major film company can avoid dealing with theater chains.

CAPABILITIES AND PROBLEMS POSED BY THE NEW TECHNOLOGIES

To understand the legal and political pressures that new technologies place on the intellectual property system, one needs to under-

stand their unique capabilities. A few examples convey the scope and pace of technological progress and the problems that it poses:

- **A problem of identifying authorship**: A group of authors using personal computers connected by a telephone network can collaborate in writing an article, a piece of software, or a database. This work can exist in various forms, in different places, and can be modified by anyone having access to the network. This networking technology provides new opportunities to combine talents, resources, and knowledge. Also, using satellite technology, authors, scholars, or other creators from all over the world can work together simultaneously on the same project.

  However, this same networking capability might create problems for the intellectual property system. Copyright, for example, is granted to "original" works of "authorship." In a world where there are many authors of one work, worldwide collaboration, and ever-changing materials, a law based on the concepts of originality and authorship may become too unwieldly to administer.

- **A problem of identifying infringements and enforcing rights**: The increased communications capacity (in terms of speed, bandwidth, and distance) made possible by fiber optic technology will allow computer users to rapidly transmit incredible amounts of information at a rate of 100 average length pages in a second. Such a capability could permit the creation of centralized libraries with universal access.

  On the other hand, these high-speed communications media, combined with large capacity optical disk storage technologies, will also pose enforcement problems for the intellectual property system. They allow individuals to trade vast quantities of copyrighted materials without the knowledge or permission of copyright holders. With these technologies, the situation is no longer simply one of an individual trading or giving away a book to someone else; rather, it is one in which individuals can inexpensively and privately share the contents of an entire library.

- **A problem of private use**: At the end of World War II, copyrighted information flowed into American homes through three channels—print publications, radios, and phonograph records. And although people could enjoy these works freely, they could not copy them conveniently and at low cost. Today, the situation has changed radically. Americans can now receive a much greater amount and variety of copyright materials via a whole host of new media—satellite, cable and broadcast television, computers, videocassette recorders, and telephone lines, to name a few. Moreover, using computer networking technology, they can now easily and inexpensively reproduce and transmit copyrighted works.

  This remarkable state of affairs raises several problems for the copyright system. First, if a private citizen copies information—a film or record, for example—should this be considered an infringe-

ment of copyright? At present, the law gives little guidance in this area; nor, until recently, did it need to. Such private use was so limited it posed no threat to industry profits. Second, if it were decided that home copying infringed copyright, how could a ban against it be enforced? Since many people could be engaged in this kind of behavior in the privacy of their own homes, their activities would be impossible to track.

- **A problem of functional works:** At one time a writer wrote solely to communicate meaning to his readers. He did so in novels, biographies, news stories, scientific treatises, and even in recipes. Today, however, a writer can write for a machine rather than a human audience. He does so when he writes computer software—instructions that tell the machine what to do. A computer program can also create new programs, and even control industrial processes. In the future, information itself will play a similar functional role. A piece of information entered into a database, for example, may automatically retool one of several manufacturing facilities.

  Writings of this kind are becoming central to the economy because they can efficiently substitute for labor and mechanical processes. It is, however, precisely the capability of substituting for machine processes that causes problems for the traditional intellectual property system.

  Intellectual property law provides two basic forms of protection—patent and copyright. These schemes reflect a basic distinction between invention and authorship. Inventions are essentially useful devices or processes, whereas works of authorship convey information and ideas. And although both schemes encourage the production and dissemination of ideas, they do so in two different ways. Patent requires disclosure, and copyright assumes that in order to profit from a work, an author must publish it. Moreover, the types of protection granted reflect the differences between writings and inventions. Copyright prevents commercial copying; patent prevents commercial use.

  With the development of computer software and other functional works, the clear distinction between inventions and writings is beginning to break down. These developments raise questions about whether new information-based products can be accommodated within the old legal framework, and whether efforts to do so will undermine the original intent of the law.

- **A problem of derivative use:** A major newspaper maintains its index on computer. A user of this index takes the information in it and analyzes it for another client, giving him up-to-date, timely information that is precisely tailored to his needs. Using electronic technology, a research chemist can search all bibliographic data on a particular chemical in a matter of hours, instead of the weeks it once would have taken. An investor who must make a snap decision about whether to buy or sell can call up a constantly updated database, and use the information to pursue his profits.

The new information technologies, which allow for this kind of customized information on demand, are creating a wide range of new opportunities to expand the variety, scope, and sophistication of information-based products and services. In fact, a whole new industry has developed to provide these services; and it is now one of the fastest growing sectors in the economy.

As the opportunities to create derivative works increase and as this sector comes to play a larger role in the economy, questions arise about what kinds of information can legally be used to create secondary information products. Under existing intellectual property law, copyright holders have the right to benefit from all subsequent works based on their original works. If interpreted broadly, it is possible, however, that this approach will inhibit the production and use of secondary materials.

- **A problem of intangible works**: In their homes, people can now receive electronically a broad range of information-based products and services—e.g., shopping, stock market and banking information, educational software, videogames, films, and musical works, to name a few. In the long run, however, individual access to information may be more costly and thus more limited as intellectual work become transmitted in intangible forms.

Publication and dissemination of intellectual works were fostered under the traditional copyright scheme because authors had to publish copies of their work in order to profit. Although the author retained the right to print and publish a work, he no longer controlled the copies after the first sale. Since public dissemination went hand in hand with profit-making, this system promoted the interests of both the public and the author.

As more and more works are transmitted electronically, however, public access to information, originally built into the copyright system, may in fact become more limited. Not only may the individual price of information be higher; now people may have to pay for it every time they wish to use it.

When printing was the dominant technology, this was not the case. Once a person bought a copy of a book or magazine, he owned it. It became his personal property. He could consult it repeatedly, without additional cost. He could share it, rent it, or resell it, without the proprietor's permission. The copyright holders, therefore, did not control the market for their works. This monopoly was limited. Booksellers competed for sales, not only with the proprietor, but also with one another. Information, therefore, was available from many sources at a competitive price.

With the electronic distribution of works, however, proprietors have more control. Because their works need not be sold in hard copies, and because it is questionable whether individuals can legally copy them, they do not have to compete with resellers, wholesalers, or others who might drive down the price of their products. As the only source of distribution, people must come to the

copyright holder on his own terms. Now controlling access to their works, copyright holders can restrict it in order to enhance their profits. If they were to do this, copyright law would no longer perform the function it was designed for under the Constitution. Moreover, once copyright serves to limit access, it raises issues for communications policy as well as for copyright.

- **A problem of meeting educational goals**: The intellectual property system was originally designed to enhance learning and the useful arts. This goal is more difficult to meet today because of the increasing market value of intellectual properties. The technologies provide numerous opportunities for educational use. However, because software development is often expensive, it is in the interest of the developer to concentrate on products for customers who can pay the most—businesses, not schools. The schools then have the choice of doing without software, diverting money from other equally needed educational materials, or developing their own software, since they cannot legally copy copyrighted works. The copyright problem in this situation is simple: Copyright, designed as a policy tool to enhance learning, fails to meet its goal.
- **A problem of integrity**: Assisted by the computer, a film maker can create scenes that were never actually filmed, or take existing images and place them in entirely new contexts. These capabilities open new avenues for creativity. But at the same time, they may be used to misrepresent a work or undermine its integrity. An unscrupulous artist, for example, might use technology to distort a well-known piece of art for his own purposes or profit without the knowledge of the original artist. In this electronic environment, creators may become as concerned about the integrity of their works as they are about their profits. To be effective, intellectual property law may need to take into account the problem of artistic integrity, as well as that of financial rewards.
- **An international problem**: All of the capabilities and problems that characterize domestic use of the new technologies are equally prominent—sometimes more so—when they are used internationally. Satellite technology permits global communication, but it also beams in programming that nations may not want. Satellites collect valuable agricultural and environmental information about the developing world. But once it has been analyzed by a commercial company and copyrighted, it may be priced too high for developing countries to afford. A nation near the United States is able to pick up and unscramble satellite programming that viewers want—and do so without paying the fee charged by the company. Domestic companies have no way to monitor use or enforce their copyright claims. These problems are exacerbated by considerable disagreement among nations about intellectual property issues.

WHAT ARE THE STAKES?

The new technologies are extremely powerful tools. For the United States, therefore, the stakes of identifying the best laws and policies for their use are very high. These stakes fall into three general categories: 1) economic, 2) social and personal, and 3) political.

Economic

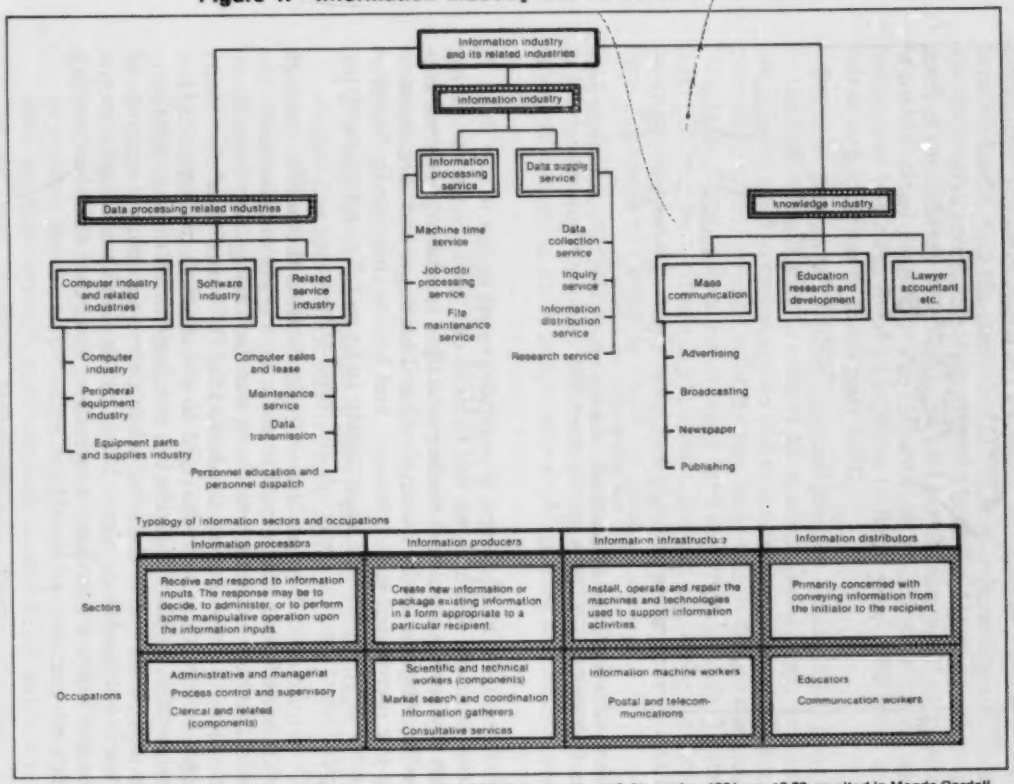
Information technologies and information-based products and services are becoming central to the economy as a whole. The new technologies and the information they embody can be used to improve efficiency, increase productivity, and thus engender economic growth. Information is reusable, and unlike capital resources, such as steel or iron, it can be produced and distributed using few physical resources. Not only is information an efficient substitute for labor, it can also be used to improve the overall efficiency of the production process. Businesses, for example, are now applying computer technology to almost all of their activities: from recruiting to laying off workers, from ordering raw materials to manufacturing products, from analyzing markets to performing strategic planning, and from inventing new technologies to designing applications for their use. To serve these needs, a whole new industry has been spawned. (See figure 1.) One of the fastest growing sectors of the economy, this industry is spearheading the Nation's economic growth and enhancing its competitive position in the international marketplace.

The economic stakes raised by the new technologies are particularly high for the copyright industries—publishing and other industries that rely on the legal protections provided by copyright law. It is estimated that in 1982, the combined sales of these industries constituted approximately 5 percent of the gross national product. Estimates suggest that more than 2.2 percent of the labor force is affected by trade in intellectual property. The amount of financial damage that these industries suffer due to infringements of intellectual property rights is extremely hard to estimate. Very few independent, quantitative data are available, and existing analyses often contradict each other.

Social and Personal

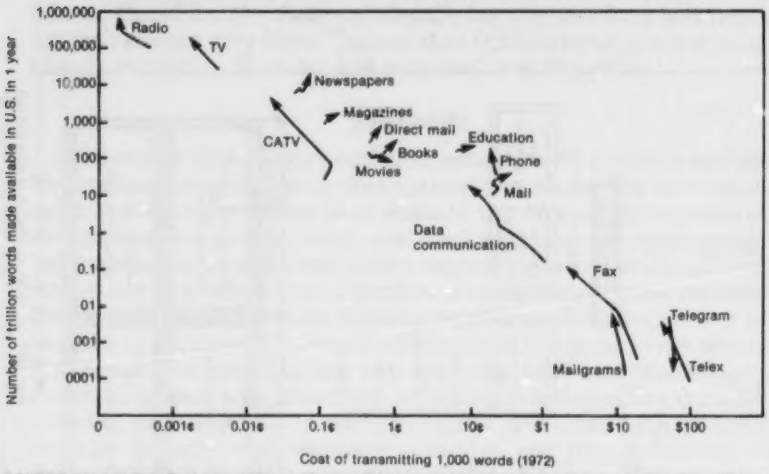
Information is a dominant force in our lives. In the United States, an enormous amount of information is communicated in the form of words through electronic media. In the 1970s, for example, it was estimated that the American population was exposed to about 8.7 trillion words each day through electronic media such as radio; television; and print media such as newspapers, books, and magazines. This figure is rising; each year, the number of words communicated increases at an average rate of 1.2 percent per year. And, as is illustrated in figure 2, the fastest growing media for transmitting and receiving information are electronic.

Figure 1.—Information Industry and Its Related Industries



SOURCE: H.P. Gassman, "Is There a Fourth Economic Sector?" *OECD Observer*, No. 113, November 1981, pp. 18-20, as cited in Magda Cordell McHale, *Facts and Trends: The Changing Information Environment: An Information Chartbook* (Rome: Intergovernmental Bureau for Informatics, 1985), p. 32.

Figure 2.—Trends From 1960 to 1980: Volume and Costs of Communication by Media: USA (plotted on log by log scales)



SOURCE: Ithiel de Sola Pool, Hiroshi Inose, Nozomu Takasaki, and Roger Hurwitz, *Communication Flows* (Tokyo: University of Tokyo Press or New York: Elsevier, 1984). Reprinted with permission.

Information, in all forms, is essential to all facets of our lives. It is the principal resource we use to meet our personal needs: coping with day-to-day problems; dealing with life's traumas and crises; supporting religion, family life, and cultural heritage; and accommodating our recreation, entertainment, and leisure time needs. Never in history have we had the opportunity to be so fully and currently informed about world, national, and local affairs.

Given the central importance of information, the public has high stakes in decisions about intellectual property rights. Moreover, the public has high expectations about how technology can serve its information needs. A survey conducted for OTA confirmed that many people believe they have the right to use these technologies as they please, although they draw the line at using them for commercial gain. The generation now in the schools has grown increasingly accustomed to the benefits of technology. Many youth view their telephones and tape recorders, videocassette recorders, and other electronic devices as an integral part of their lives.

Political

In democratic societies, citizens must be well informed about issues, candidates for office, and local affairs. Similarly, a democratic polity requires a well-informed citizenry. Increasingly, information and communication technologies serve these information needs.

The Government regularly needs huge amounts of information to make complex legal and policy decisions. Many Government agencies would find it hard to conduct their daily business without resorting to customized information on demand. The Internal Revenue Service and the Social Security Administration, for example, require large automated information systems to handle the accounts of hundreds of millions of clients. And the operation of national defense depends on the use of complex communication systems both for day-to-day management of the military establishment and for the command and control of sophisticated weaponry. The Government's budget for information technology has risen from $9.2 billion in fiscal year 1982 to an estimated $15.2 billion in fiscal year 1986.

Citizens' groups and political parties are also relying more heavily on the new technologies to achieve their aims. Technology, for example, is being used to target voters and potential supporters, communicate with voters, manage information, and even to design campaign strategies. Computers are also being used as lobbying tools. To illustrate the long-term effects of population growth, one lobbying group, for example, uses a portable computer and interactive software to inform Members of Congress about its point of view.

In each of these realms—economic, social, and political—the stakes in the intellectual property debate are rising as fast as the technologies are becoming more technically sophisticated and widely used.

POLICY UNCERTAINTIES

In designing new laws or policies on intellectual property, the Government will have to contend with a number of uncertainties. These include:

- **The peculiar characteristics of information as a commodity**: Information has special characteristics that distinguish it from other economic commodities and confound our understanding of how information markets work. Information is, for example, simultaneously an economic commodity and a societal resource. Since it is inherently leaky; it is hard to own or control. And although costly to produce, information is inexpensive to copy. Given these unique properties, economists are only beginning to understand the role of information in the market place. They have yet to determine, for example, how to measure value or identify when value is added to an information-based product or service—both needed to resolve issues of derivative use. Moreover, the few available data are fragmentary, nonquantitative, and often subjective.
- **The increased complexity of the intellectual property system**: The new technologies are increasing the complexity of the intellectual property system, and so creating new uncertainties for policymakers. The number and variety of information providers, kinds of information-based products and services, ways of using informa-

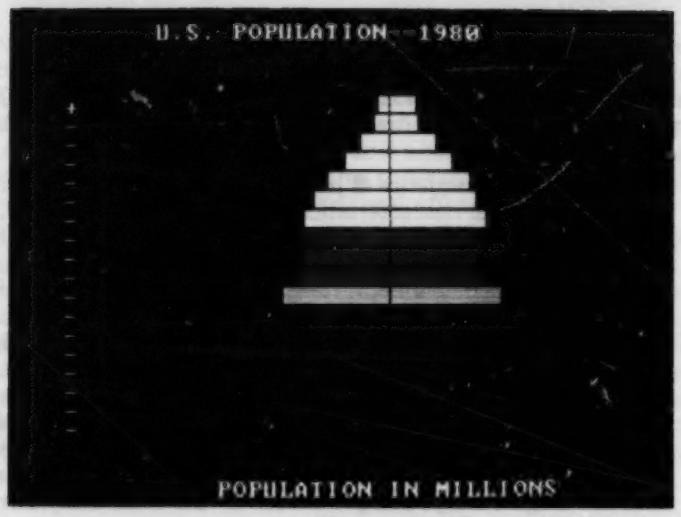


Photo credit: Population-Environment Balance, Inc.

The Environmental Fund uses interactive computer programs to show Congressmen the long-term effects of population growth.

tion, and types of information users are proliferating, giving rise to new relationships among the parties involved. These changes are occurring in very unpredictable ways. Thus, in the future, Congress will need to have more information about the intellectual property system.

- **The changing nature of the technology**: The electronic age has just begun. Today, new technologies are multiplying the kinds of media that can be used to package, store, deliver, and use intellectual works. Over the long run, however, the increased convergence of information and communication technologies may reverse this trend. Packaged, stored, and delivered electronically, text, sound, and images will all be interchangeable. Our understanding of how and when such changes will take place, and of how they might affect the intellectual property system, is replete with uncertainty.

AGENDA FOR CONGRESS

Faced with a growing number of requests for action, in addition to a ubiquitous and rapidly changing technology, Congress confronts the problem of trying to take into account the magnitude and the scope of technological change, while also balancing interests and responding to present concerns. In considering how Congress might proceed, OTA identified five major strategic choices:

1. what policy goals to pursue,
2. whether and when to act,
3. what legal framework to use,
4. how broadly to define the problem, and
5. within what institutional framework issues should be resolved.

What Policy Goals To Pursue

OTA found that the intellectual property system may no longer serve social, economic, and political goals with the same ease in an information age, given the enhanced value of information in all realms of life. It is likely, therefore, that Congress, when designing new intellectual property laws and policies, will have to choose more explicitly among policy goals. Alternatively, Congress could use policy mechanisms other than the granting of intellectual property rights to foster some goals not supported by the present system. In the pursuit of economic goals, for example, other economic incentives—such as subsidies or tax exemptions—might be granted. Unlike the extension of intellectual property rights, such mechanisms would have few negative consequences for learning and the creative environment.

Whether and When To Act

Decisions about when to act are clearly related to decisions about whether to act, and to decisions about whether to deal with problems separately or in a comprehensive fashion. In considering these choices,

OTA found that technological developments are, indeed, affecting all aspects of the intellectual property system. Moreover, because we are only beginning to move into an electronic era, the full impact of the new technologies will not become completely apparent for some time. Fundamental changes in technology are occurring that will antiquate many of today's solutions and bring new kinds of problems requiring new kinds of solutions. Thus, even if Congress decides to act now in some areas, it will need to be prepared to reconsider these actions within the next decade.

Some problems are particularly pressing because stakeholders are seeking immediate legislative action, societal stakes are particularly high, or technological change is occurring so rapidly that Congress must act sooner rather than later if it wants to deliberately channel its impact. OTA identified four such problems: enforcement, private use, functional works, and the international intellectual property system.

Other problems, although equally important, are less ripe for immediate action. Engendered by technologies still in their infancy, these problems are only now just emerging, and our understanding of them is severely limited. Examples of such problems include assigning value and distributing rewards in cases of derivative use, protecting the integrity of works in an electronic environment, and attributing and assigning authorship when works are generated by interactive or electronic processes.

Although it may be too early to determine long-term solutions to these problems, OTA concluded that some steps will need to be taken now if they are to be adequately dealt with in the long run. One approach might be to begin now to systematically collect data about, and enhance our understanding of, information needs, information users and producers, and information-based products and services. This approach might require institutional changes, since, at present, no agency within the Government is set up to carry out such a task.

What Legal Framework To Use

The intellectual property system was carefully designed to balance the public and the private interest. OTA found, however, that because the new information and communication technologies do not fit neatly within the existing framework of the law, the balance may be harder to achieve in the future

OTA identified functional works as a particularly serious problem in this regard. The analysis found that the distinction between writings and inventions is indeed breaking down with respect to functional works such as computer software and semiconductor chip masks. Because there are many works of this type, they may require their own framework for protection. If it were based on the distinctive characteristics of these works, the law might be more accurately targeted

to achieve specific policy outcomes, thus serving as a more robust policy tool. With a new category of law, both producers and users would face less uncertainty each time a new type of work were introduced. OTA's analysis suggests, too, that a fruitful basis for a revision along these lines might be found in the distinctions between works of art, works of fact, and works of function.

How Broadly To Define the Problem

OTA found that intellectual property policy can no longer be separated from other policy concerns. Because information is, in fact, central to most activities, decisions about intellectual property law may be decisions about the distribution of wealth and social status. Furthermore, given the unlimited scope of the new technologies and the growing trade in information-based products and services, U.S. intellectual property policy is now inextricably tied to international affairs. Communications policy, too, is becoming more linked to intellectual property policy, as more and more intellectual works are being transmitted by media such as cable television, telephone lines, and communication satellites. Today, intellectual property issues also give rise to privacy concerns as copyright holders seek technical means to monitor use. In making decisions about intellectual property policy, therefore, Congress must consider a whole new range of issues, and decisionmakers in all these areas will need to strive for greater coordination.

Within What Institutional Framework Should Intellectual Property Issues Be Resolved

OTA found that intellectual property issues cannot be resolved without dealing with the question of institutional capabilities and change. In the absence of institutional change, the courts will increasingly be called on to resolve highly complex and technical issues and to make policy in this area. The judiciary, however, may not be suited for this role.

The pace of technological change will continue to put pressure on existing institutional arrangements. To the extent that Congress, in responding to these changes, adopts legislation requiring a more active Government role, new institutional arrangements will probably be required. If this were to be the case, Congress might want to expand the responsibilities of existing agencies, or it might establish a new central agency to address intellectual property issues. Such an agency's mission might include monitoring technological change and assessing how the law might deal with it, providing the necessary expertise to deal with complex technological issues, and collecting and analyzing data about information markets and use. Such an agency might also assume additional regulatory functions, such as distributing rewards or adjudicating disputes. Finally, it might coordinate intellectual property policy with policy in related areas.

THE OTA STUDY

The request for this assessment, *Intellectual Property Rights in an Age of Electronics and Information,* was made by Senator Charles McC. Mathias, Jr., Senate Committee on the Judiciary, and by Congressmen Peter W. Rodino, Jr., Robert W. Kastenmeier, Hamilton Fish, and Carlos Moorhead, House Committee on the Judiciary.

In thinking about how the new communication and information technologies might affect intellecual property rights, OTA has adopted a broad approach, looking at the kinds of stresses that technology might be placing on the intellectual property system as a whole, and on each of its parts. Such an approach was required because the new technologies do not necessarily have a direct effect on intellectual property rights. Rather, more often than not, their influence on the law is felt indirectly, as a result of such things as technologically induced changes in norms, values, and expectations, as well as in the ways in which intellectual works are created, produced, marketed, and distributed.

Such an approach is also useful because, given the political intensity and high economic stakes of the intellectual property debate today, it is extremely important to view the entire situation as all one piece. Those involved in the policy debate often define issues solely in terms of their own interests and world views.

NOTE: Copies of the full report "Intellectual Property Rights in an Age of Electronics and Information" can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, GPO stock No. 052-003-01036-4.

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